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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/756,542	01/13/2004	Stephan Mueller	5308-166CT	3861
20792	7590	03/03/2006	EXAMINER	
MYERS BIGEL SIBLEY & SAJOVEC PO BOX 37428 RALEIGH, NC 27627			SONG, MATTHEW J	
			ART UNIT	PAPER NUMBER

1722

DATE MAILED: 03/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/756,542

Applicant(s)

MUELLER, STEPHAN

Examiner

Matthew J. Song

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 December 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 11-14 and 16-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 11-14 and 16-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 16-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Balakrishna et al (US 6,056,820) in view of Uchida et al (EP 0 962 963).

Balakrishna et al teaches a method of growing silicon carbide boules by physical vapor deposition (PVT), where a silicon carbide seed crystal 16 is carried by a seed holder 18 and high purity silicon is melted and vaporized in a PVT chamber and a silicon carbide is formed from a gaseous species resulting from the reaction of the silicon vapor and a carbon disc (col 1, ln 59-col 2, ln 67). Balakrishna et al also teaches a flux of silicon vapor is used to the silicon carbide boule (col 3, ln 30-50).

Balakrishna et al does not disclose forcing nucleation sites of a silicon carbide seed crystal to a predefined pattern.

Uchida et al discloses a method of producing silicon carbide on a silicon carbide substrate, where a 4H hexagonal silicon carbide single crystal substrate, this reads on seed crystal, is masked by a graphite plate or a graphite sheet having a predetermined mask pattern and introduced into a CVD growing chamber and growth is developed only in a partial region corresponding to the mask pattern to form a 6H hexagonal silicon carbide on a predetermined

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region on a surface of a 4H hexagonal silicon carbide substrate, this reads on forcing nucleation sites of a silicon carbide seed to predefined pattern (Example 8). Uchida et al also teaches the invention is not limited to CVD and Molecular beam epitaxy or other methods may be used (col 15, ln 25-35). Uchida et al also teaches homoepitaxial growth of a 4H crystal structure, which is the same as the silicon carbide substrate by heating to a temperature greater than 1600°C, this reads on applicant's same polytype (col 13, ln 55 to col 14, ln 10). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Balakrishna et al with Uchida et al's mask pattern to force nucleation sites to a predefined pattern because a crystal of silicon carbide can be easily grown in a desired region (col 19, ln 1-10).

Referring to claim 16, the combination of Uchida et al and Balakrishna et al teaches a masked pattern of material of graphite, as applicant, and growth of silicon carbide occurs in partial region corresponding to the mask pattern. The regions of having a reduced sticking coefficient over other regions of the seed crystal is inherent the combination of Uchida et al and Balakrishna et al because the same material will inherently have the same sticking coefficients.

Referring to claim 16 and 19, the combination of Uchida et al and Balakrishna et al teaches a graphite mask on a silicon carbide substrate, i.e. seed, with a predetermined pattern.

Referring to claims 17, 18 and 20, the combination of Uchida et al and Balakrishna et al is silent to the shape of the predetermined pattern. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Uchida et al and Balakrishna et al by changing the shape of the predetermined pattern to grow different shapes of silicon carbide. Furthermore, Changes in size, dimensions, shape, proportion or mere duplication of parts are not sufficient to patentably distinguish over the prior art, unless the recited changes

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are critical, i.e., they produce a new and unexpected result which is different in kind and not merely in degree from the result of the prior art. In re Rinehart, 531 F.2d 1048, 189 USPQ 143. See also In re Dailey, 357 F.2d 669, 149 USPQ 47. See also In re Harza, 274 F.2d 669, 124 USPQ 378.

3. Claims 11-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Balakrishna et al (US 6,056,820) in view of Vichr et al (US 5,753,038).

Balakrishna et al teaches a method of growing silicon carbide boules by physical vapor deposition (PVT), where a silicon carbide seed crystal 16 is carried by a seed holder 18 and high purity silicon is melted and vaporized in a PVT chamber and a silicon carbide is formed from a gaseous species resulting from the reaction of the silicon vapor and a carbon disc (col 1, ln 59- col 2, ln 67). Balakrishna et al also teaches a flux of silicon vapor is used to the silicon carbide boule (col 3, ln 30-50).

Balakrishna et al does not teach forcing nucleation sites of a silicon carbide seed crystal to a predefined pattern.

Vichr et al discloses a method of growing crystal, note entire reference, where a seed plate is patterned by depositing a patterned masking layer and the patterned seed plate is selectively etched to expose the bare surface of the seed plate, then the exposed, patterned bare surface of the seed pate is etched to form a plurality of nucleation structures consisting of the seed plate material and the remaining portion of the masking layer. Vichr et al also discloses each of the nucleation structures protrude outwardly from the underlying surface of the seed plate and provide ideal structures for single crystal growth and each structure comprises walls

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and a top surface (col 3, ln 45 to col 4, ln 67 and claim 1 and Fig 3). Vichr et al also discloses the seed plate can then be placed into a CVD crystal growing reactor and epitaxial crystal are grown on top of the mesas (col 5, ln 40-65), this regions of the seed crystal which extend beyond other regions of the seed crystal. Vichr et al also discloses the masking layer design consists of circles or squares or other geometrical figures on a rectangular, hexagonal or other grid pattern (col 9, ln 45-60). Vichr et al also teaches the crystal growth technique used to grow the large crystals is not critical and a variety of methods may be used (col 8, ln 55 to col 9, ln 5). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Balakrishna et al with Vichr et al to form large single crystals having high monocrystalline perfection which is can be used in electronic applications (col 3, ln 49-55).

Referring to claim 11, the combination of Balakrishna et al and Vichr et al teaches growth on the sidewall of the mesas ('038 col 4, ln 15-25), this reads on applicant's preferentially growing on the sidewall because growth on the sidewall is taught.

Referring to claims 12-14, the combination of Balakrishna et al and Vichr et al teaches circles or squares or other geometrical figures on a rectangular, hexagonal or other grid pattern. A square pattern on a rectangular pattern reads on stripes. Furthermore, Changes in size, dimensions, shape, proportion or mere duplication of parts are not sufficient to patentably distinguish over the prior art, unless the recited changes are critical, i.e., they produce a new and unexpected result which is different in kind and not merely in degree from the result of the prior art. In re Rinehart, 531 F.2d 1048, 189 USPQ 143. See also In re Dailey, 357 F.2d 669, 149 USPQ 47. See also In re Harza, 274 F.2d 669, 124 USPQ 378.

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Referring to claim 15, the combination of Balakrishna et al and Vichr et al teaches each structure comprises walls and a top surface.

Response to Arguments

4. Applicant's arguments, see page 9 of the remarks, filed 12/12/2005, with respect to the rejection in view of Beetz have been fully considered and are persuasive. The rejection of claims 11-14 has been withdrawn. Beetz does not teach growth on the sidewalls.

5. Applicant's arguments, see page 5 of the remarks, filed 12/23/2005 with respect to the rejection in view of Yonehara have been fully considered and are persuasive. The rejection of claims 16-20 has been withdrawn.

6. Applicant's arguments filed 12/23/2005 have been fully considered but they are not persuasive.

Applicant's argument that Vichr does not disclose growing the silicon carbide preferentially from the sidewalls is noted but is not found persuasive. Vichr et al teaches growth from the sidewalls (col 4, ln 15-25); therefore meets the claimed limitation of preferentially growing silicon carbide from the sidewalls.

Applicant's argument that Uchida et al teaches growing a different polytype is noted but is not found persuasive. Uchida et al also teach a process where a SiC is formed homoepitaxially, where the SiC deposited on the substrate has the same crystal structure (col 14, ln 1-10), this reads on applicant's same polytype.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Sawin et al (US 5,450,205) teaches CVD and physical vapor transport are methods of depositing thin films of a substrate (col 4, ln 25-35).

Cline et al (US 3,990,093) teaches a suitable mask for semiconductor devices define one or more geometrical shapes, for example a circle or a square (col 2, ln 25-32).

Vaudo et al (US 6,596,079) teaches the use of patterned seeds with etched regions or coated regions that prevent growth on specific regions of the seed in order to reduce defect density in boule growth using patterned interlayers taught by Beetz (US 5,006,914) (col 6-7).

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

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however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

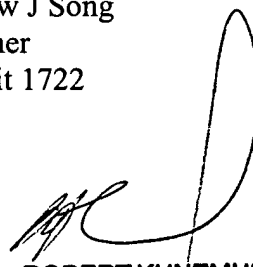
9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duane Smith can be reached on 571-272-1166. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew J Song
Examiner
Art Unit 1722

MJS
February 26, 2006



ROBERT KUNEMUND
PRIMARY EXAMINER